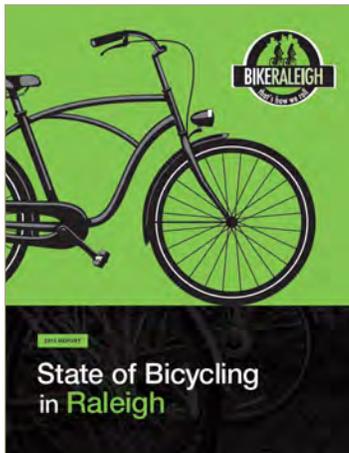


Existing Conditions

Bicycling in Raleigh has evolved since the 2009 Bicycle Plan and continues to evolve.

The 2009 Plan provided a framework for infrastructure, institutional, program, and policy investments that has led to Raleigh's bronze-level Bicycle Friendly Community status. Significant progress has been made since 2009 on building the envisioned bicycle network and elevating the profile of bicycling as a viable means of transportation in Raleigh.



The State of Bicycling in Raleigh Report was developed jointly with this Bike Plan Update. It is a standalone document and an appendix to this Plan.

This chapter provides a snapshot of the status of bicycling in Raleigh today and the needs and deficiencies that still exist. A separate, stand-alone 2015 “State of Bicycling in Raleigh Report” contains further information regarding the accomplishments in the Five E’s: Engineering, Education, Encouragement, Enforcement, and Evaluation. The report includes a map evolution of the bicycle network from 2009-2015 and timelines for accomplishments in the Five E’s. It features photographs of infrastructure and programming activities. It can be found as an appendix to this report.

REVIEW OF ACCOMPLISHMENTS FROM 2009 PLAN

The City of Raleigh has steadily accelerated their bicycle program by committing staff time and resources to the Five E’s. The City has also taken advantage of grant funding and other opportunities such as roadway resurfacing to install bicycle lanes. In addition, the Parks Recreation and Cultural Resources Department has continued to expand the Capital Area Greenway Trail System to well over 100 miles of shared-use paved paths at the time of this study, offering further riding opportunities. The following assessment of 2009 action step completion is organized by the key action steps and the Five E’s.

2009 ACTION STEP ASSESSMENT

KEY ACTION STEPS

CREATE BPAC 

HIRE BIKE/PED COORDINATOR 

BECOME BICYCLE-FRIENDLY
COMMUNITY 

ENGINEERING

ESTABLISH CIP FUNDING AND
SECURE OTHER FUNDING 

COMPLETE PRIORITY PROJECTS 

NCDOT COORDINATION 

EXPAND GREENWAYS 

UPDATE SIGNED ROUTE SYSTEM 

PROVIDE MORE BIKE PARKING 

APPLY FOR BIKE PARKING/
LOCKER GRANTS 

BUILD BIKE STATION FOR SECURE PARKING 

MAINTAIN BIKE FACILITIES 

EDUCATION

CREATE BIKE CURRICULUM 

BEGIN BIKE AMBASSADOR PROGRAM 

Key:  = complete;  = on track;  = not on track

2009 ACTION STEP ASSESSMENT

	START BIKE RODEOS	✓
	CONDUCT INTERNAL STAFF TRAINING	✗
	START MEDIA CAMPAIGN	✓
ENCOURAGEMENT		
	DEVELOP RALEIGH BIKE MAP	✓
	EXPAND SAFE ROUTES TO SCHOOL	✓
	PROMOTE BIKE TO WORK MONTH	✓
	FEATURE BIKE EVENTS/RIDES	✓
ENFORCEMENT		
	ESTABLISH HOTLINE	✗
	TARGET ILLEGAL BEHAVIORS	👉
	TRAIN LAW ENFORCEMENT	✓
	CREATE BIKE PATROL	✓
EVALUATION		
	FACILITY DEVELOPMENT	✓
	MORE BICYCLISTS	✓
	MORE PROGRAMS	✓
	INSTITUTIONAL SUPPORT	✓
	FEWER COLLISIONS	👉

Key: ✓ = complete; 👉 = on track; ✗ = not on track

NETWORK CONNECTIVITY AND GAP ANALYSIS

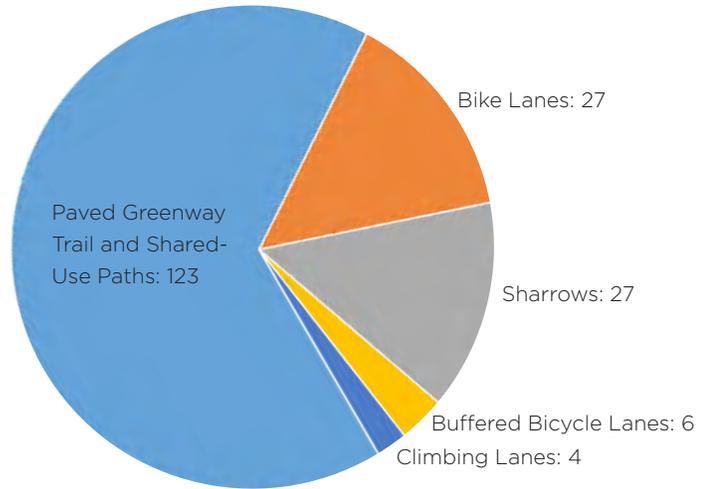
As of 2015, the total bicycle network is over 180 miles. The on-road bicycle network is over 60 miles, with 27 miles of bicycle lanes, six miles of buffered bicycle lanes, four miles of climbing lanes, and 27 miles of sharrows. The paved greenway trail and off-road shared-use path network is 123 miles. Maps showing the evolution of Raleigh’s bicycle network from 2009 to 2015 can be found in the *State of Bicycling in Raleigh Report*.

BICYCLE NETWORK GAPS

Despite implementation progress between 2009 and 2015, there are still many gaps in the bicycle network. The gaps exist in various forms, ranging from short missing links to large voids in bicycling facilities. For the purposes of this plan, there are three types of gaps:

- » **Crossing gaps** are bicycle-related intersection improvements needed for major roadway crossings (at-grade and grade-separated).
- » **Network gaps** are missing links in the network that are less than ½ mile in length.
- » **Corridor gaps** are larger geographic areas lacking any bicycle facilities. These gaps often include corridors that connect neighborhoods to destinations and other bicycle facilities such as shared-use paths.

Bike Facility Mileage

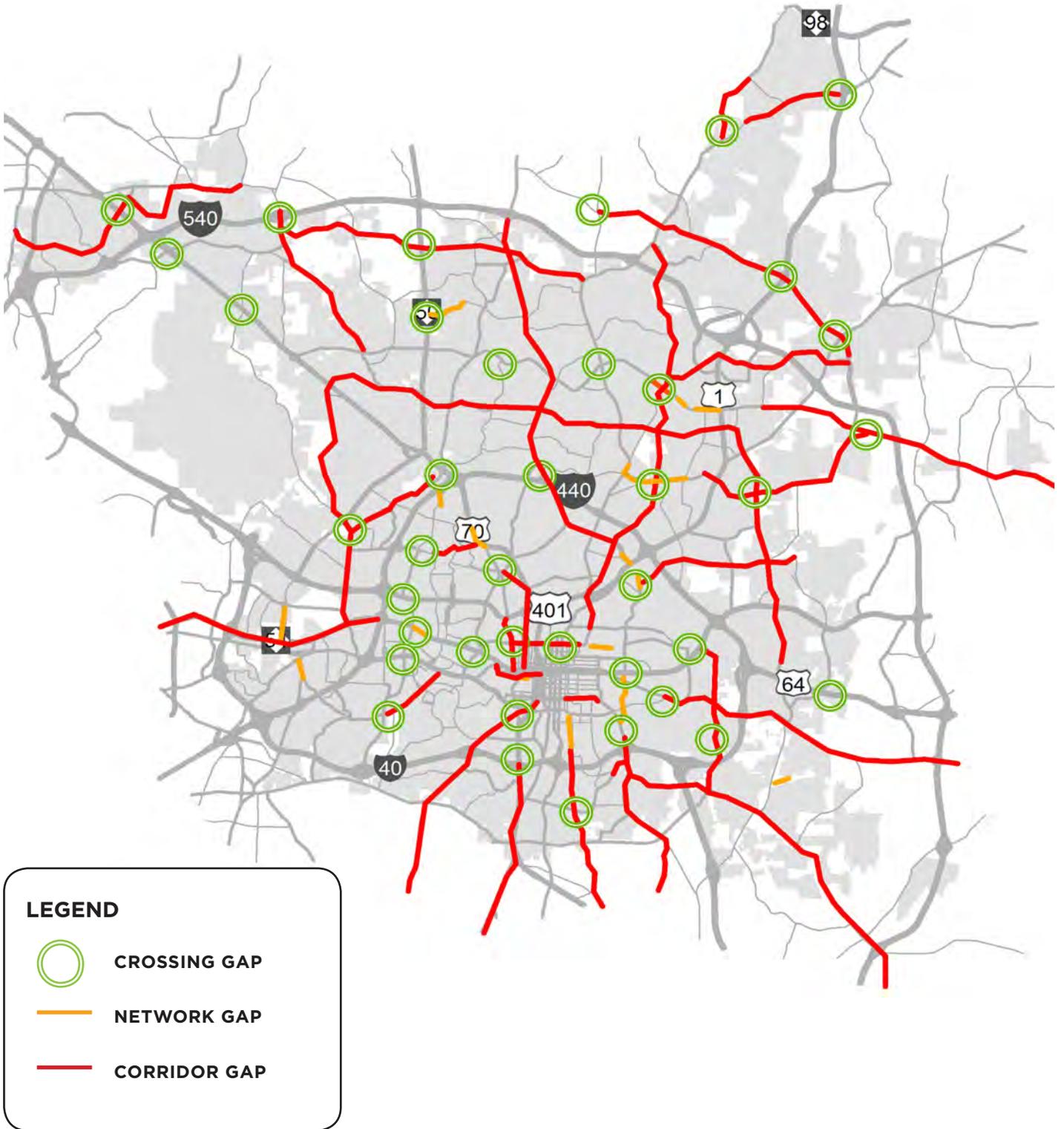


St. Mary's Street is a popular bicycle route. Although sections have shared lane markings, the corridor lacks quality facilities along several key sections from Glenwood Avenue to downtown.

Map 2.1: Existing Bike Network



Map 2.2: Bike Network Gaps





Greenway trails, such as the Walnut Creek Trail, is assigned an LTS 1 as they are perfect for most beginner riders.



Although Avent Ferry Road has bike lanes, it is still assigned an LTS 4 due to high traffic volumes, number of travel lanes and the posted speed.

LEVEL OF TRAFFIC STRESS

A bicycle network is likely to attract a large portion of the population if its fundamental attribute is low stress connectivity. In other words, a network should provide direct routes between origins and destinations that do not include links that exceed one's tolerance for traffic stress. Each user is different and will tolerate different levels of stress in their journey so the following maps should be used as a general guide rather than absolutes.

The methods used for the Level of Traffic Stress Analysis were adapted from the *2012 Mineta Transportation Institute (MTI) Report 11-19: Low-Stress Bicycling and Network Connectivity*. The approach used the following variables to classify roadways:

- » posted speed limit
- » the number (and width) of travel lanes
- » the presence of bicycle lanes
- » traffic volume

The following descriptions match the numbered key found in Map 2.3:

- » LTS 1 is assigned to streets that would be tolerable for most children to ride, and could also be applied to multi-use paths that are separated from motorized traffic.
- » LTS 2 streets are those that can be comfortably ridden by the majority of the adult population and interested but concerned bicyclists.
- » LTS 3 is the level assigned to streets that would be acceptable to enthused and confident bicyclists.
- » LTS 4 is assigned to segments that are only acceptable to highly experienced bicyclists, who will tolerate riding on roadways with higher motorized traffic volumes and speeds.

Map 2.3 Citywide Level of Traffic Stress



GROWTH IN CYCLING

The most reliable source of bicycle mode share data is the U.S. Census Bureau, which estimates the number of work commuters using various modes of transportation. The bureau only reports the primary mode for the majority of a person’s commute trips. This means that the reported data does not register trips commuters make by bicycle some days of the week when they do not cycle the majority of days. The data also does not reflect commuting trips that may be partially made by bicycle but are primarily completed using another mode. This data also excludes those who commute to school by bike or use bicycles for other non-work trip purposes. It is a limited tool to look at cycling rates.



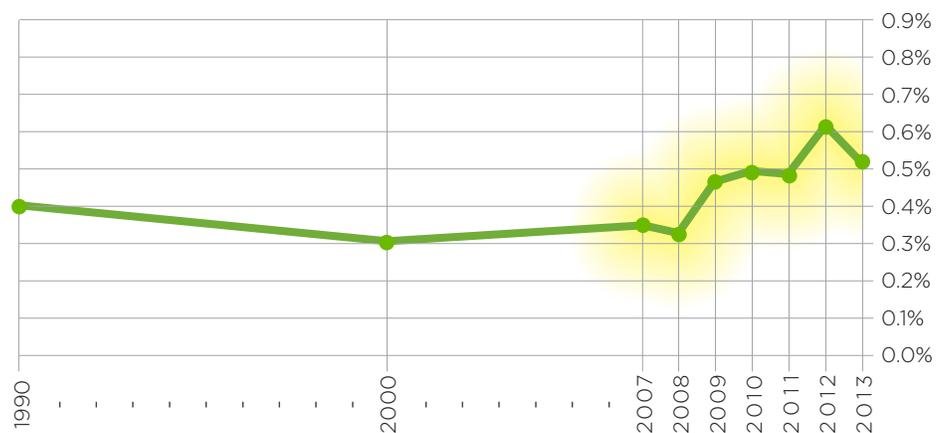
The Hargett Street bike corral is well utilized, indicating a clear demand for bike parking, especially in the downtown area.

The bicycle commute rate reported for Raleigh was relatively consistent in both the 1990 and 2000 censuses. The 2009 Bicycle Transportation Plan set a goal to quadruple the 2000 rate (0.33%) by 2015. Since 2006, commute mode has been reported in the American Community Survey (ACS), which randomly samples a small proportion of the population every year. ACS estimates have high margins of error and year-to-year variability. To somewhat reduce the margins of error, ACS data is also published in three- and five-year estimates. The three-year estimates for 2007-2013 are shown in the graph below, with the 90 percent confidence interval. Despite not reaching the goal, there has been a demonstrable increase in cycling rates in Raleigh over the past decade. This data is best used as a tool to evaluate bicycle mode share trends.

Rate of Bike Commuters

(1990 and 2000 Census, and 2007-2013 3-Year ACS Estimates)

There is anecdotal evidence that the numbers of occasional bicycle commuters and cycling rates for non-work trips may be growing faster than the census-reported commuting rate, but this information is not officially captured. It is known that only one-fifth of all trips are work-related or commute trips; it is also known that non-commute trips tend to be shorter. It is logical to expect that the ACS bicycle mode share understates the true prevalence of bicycling, but it is still a useful indicator.

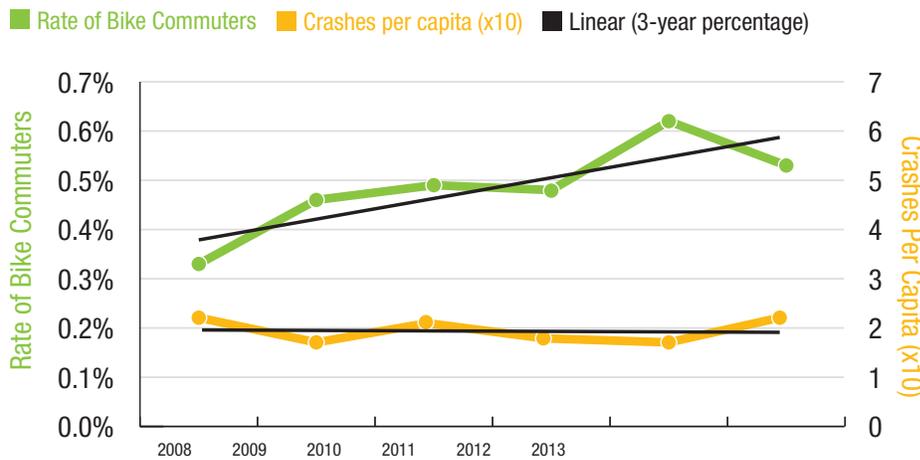


- = Rate of bike commuters
- = Confidence interval

SAFETY ISSUES

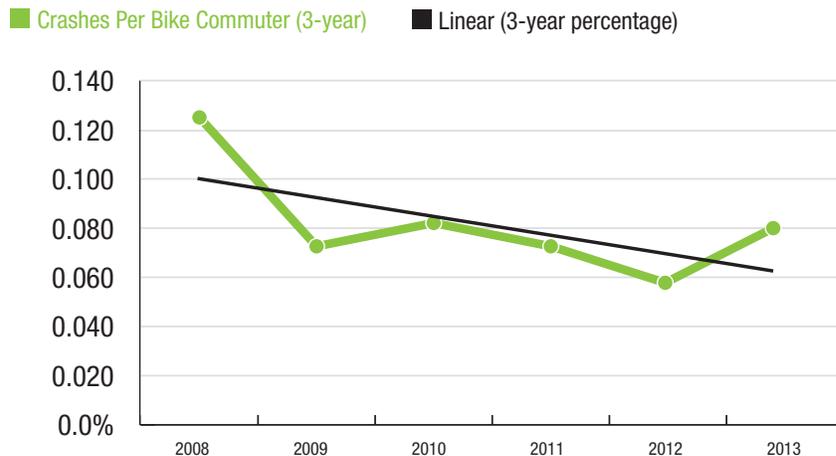
Data on reported bicycle crashes was analyzed for the period of January 2000-March 2015. When compared to the growth in bicycling realized in the last few years, bicycling in Raleigh has gotten somewhat safer. The first chart below shows that over the same period for which ACS mode share data is available, the rate of crashes per capita has not changed, even while the rate of bicycling has increased significantly.

Rate of Bike Commuters & Rate of Crashes



The best way to evaluate bicycle crash risk would be to compare the number of crashes to the quantity of bicycle miles traveled (BMT) over the same period, as BMT is a direct measure of crash risk exposure. Unfortunately, it is not possible to know the exact quantity of BMT, but the ACS-reported rate of bicycling commuting serves as an indicator for trends in BMT. The chart below shows that the rate of bicycle crashes per ACS-reported bicycle commuters has consistently declined during the period for which ACS data is available.

Crashes Per 3-Year Estimate of Bike Commuters



While the trends are encouraging, there are too many crashes and concerns about safety are certainly a barrier to bicycling for many (please see the summary of public comments later in this chapter).

**TOP CRASH LOCATIONS
(2007-2015)**

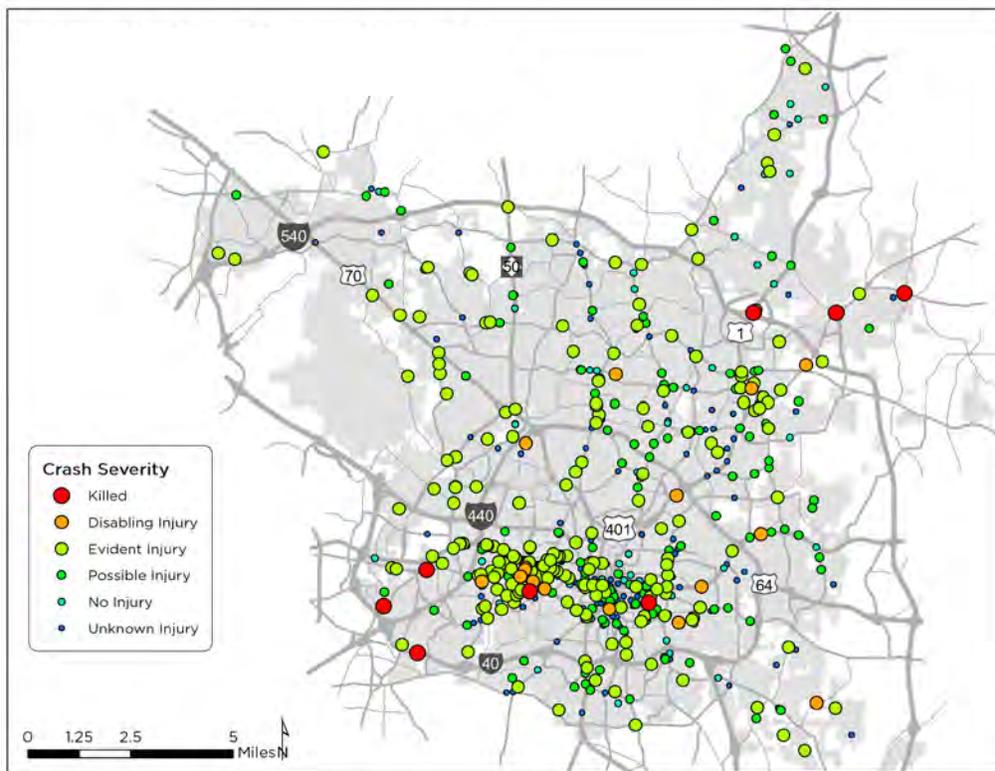
- Hillsborough & Brooks (6)
- Hillsborough & Cox (6)
- Hillsborough & Dan Allen (6)
- Hillsborough & Pullen (6)
- Six Forks & Lassiter Mill (5)
- Hillsborough & Ashe (4)
- Avent Ferry & Centennial (4)
- Avent Ferry & Trailwood (4)
- Capital & Millbrook (4)
- Dan Allen & Cates (4)
- Dan Allen & Sullivan (4)
- Glenwood & Tucker (4)
- Glenwood & Hillsborough (4)
- Hillsborough & Oberlin (4)
- Six Forks & Wake Forest (4)

Locations above in black font were among the top crash locations between 2000-2006 as well.

In order to inform the network recommendations and prioritization, bicycle crashes were mapped and examined for the period January 2007-March 2015 and compared to crash data analyzed in the previous bicycle plan (January 2000-December 2006). Maps 24-2.8 present this information. Generally, the density of bicycle crashes was highest in very similar areas; however, there has been an increase in Downtown, where bicycling has increased most. Over the recent period, 23 crashes led to a disabling injury with 9 leading to fatalities. Crash severity is shown in map 2.4 below.

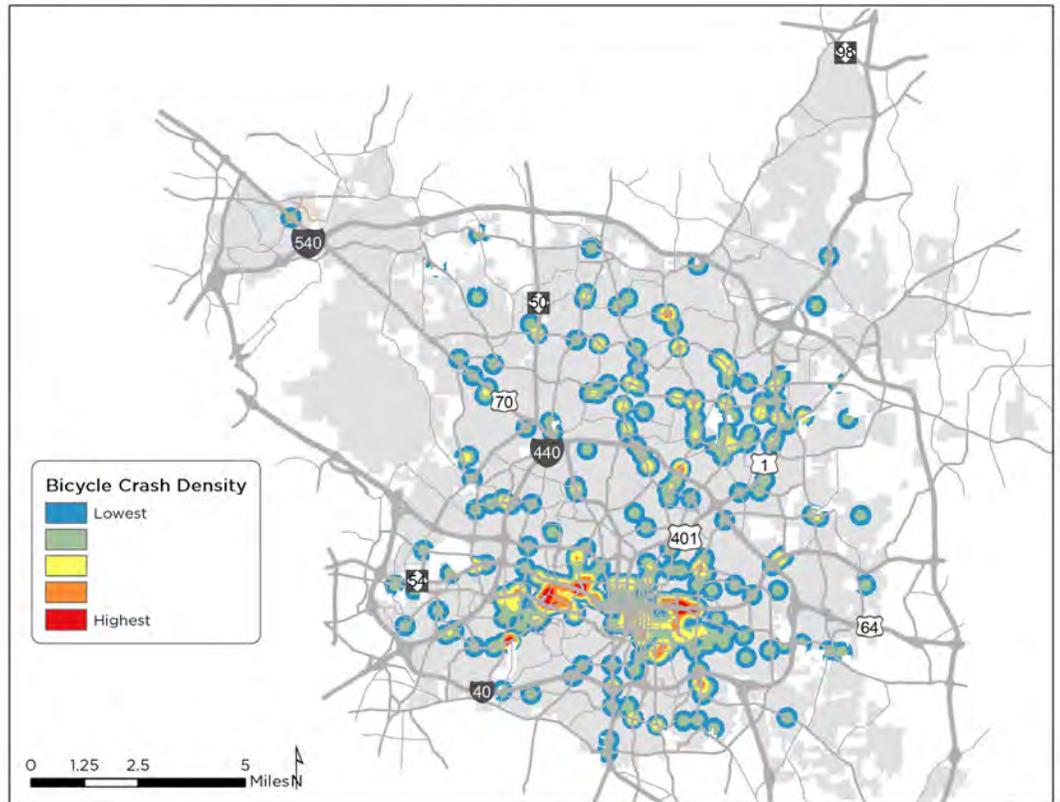
TOP CRASH CORRIDORS

<u>2000-2006</u>	<u>2007-2015</u>
Hillsborough - 26	Hillsborough - 62
New Bern - 16	Dan Allen - 17
Avent Ferry - 13	Avent Ferry - 14
Dan Allen - 13	Capital - 14
Falls of Neuse - 12	Western - 13
Six Forks - 12	Glenwood - 12
Spring Forest - 11	New Bern - 12

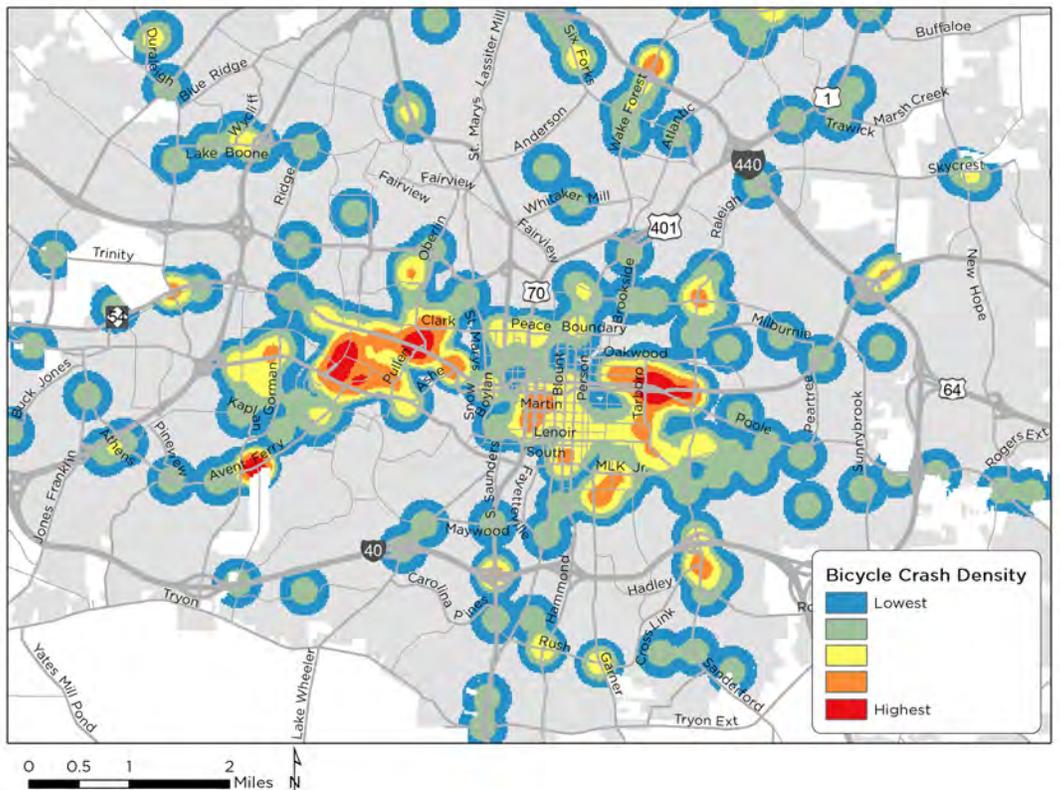


Map 2.4
Bicycle
Crash by
Severity
(2007-2015)
- Citywide

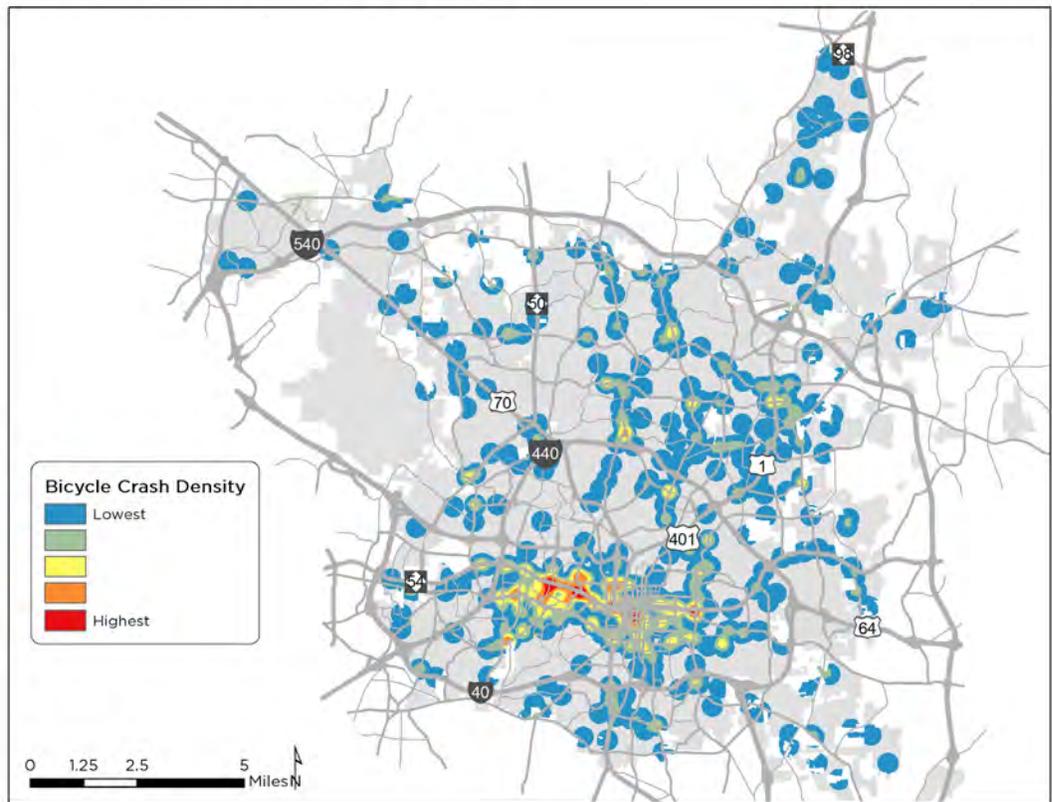
Map 2.5
Bicycle
Crash
Density
(2000-2006)
- Citywide



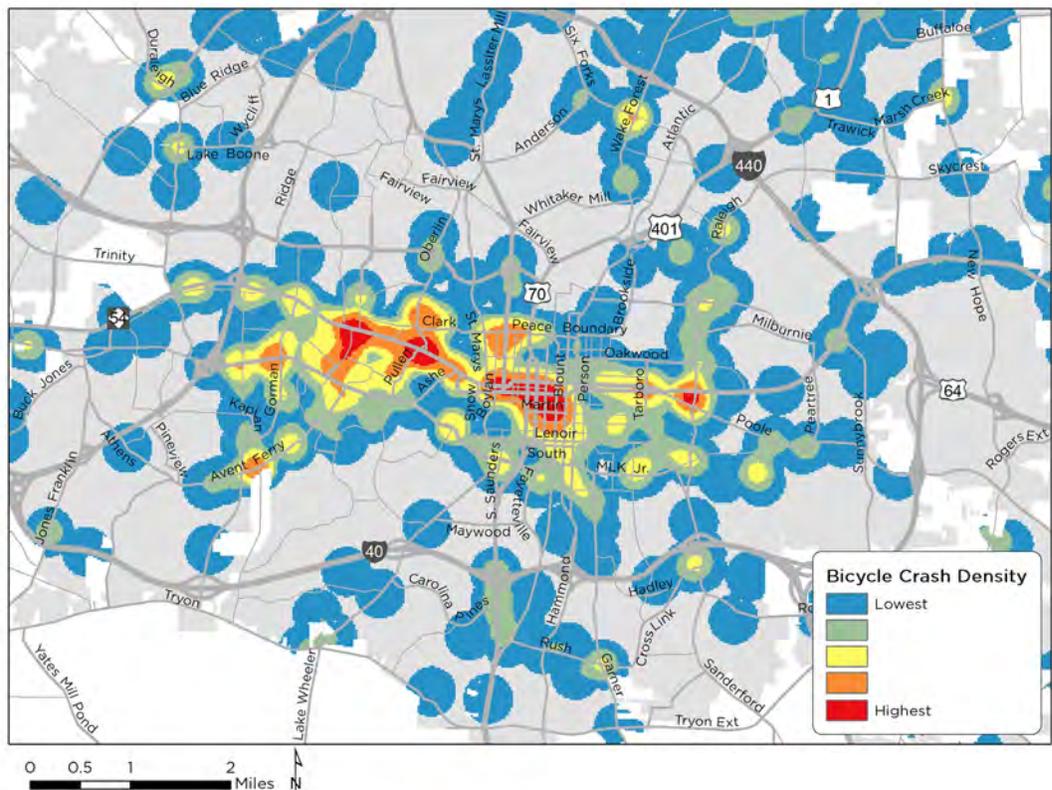
Map 2.6
Bicycle
Crash
Density
(2000-2006)
- Inside
Beltline



Map 2.7
Bicycle
Crash
Density
(2007-2015)
- Citywide



Map 2.8
Bicycle
Crash
Density
(2007-2015)
- Inside
Beltline

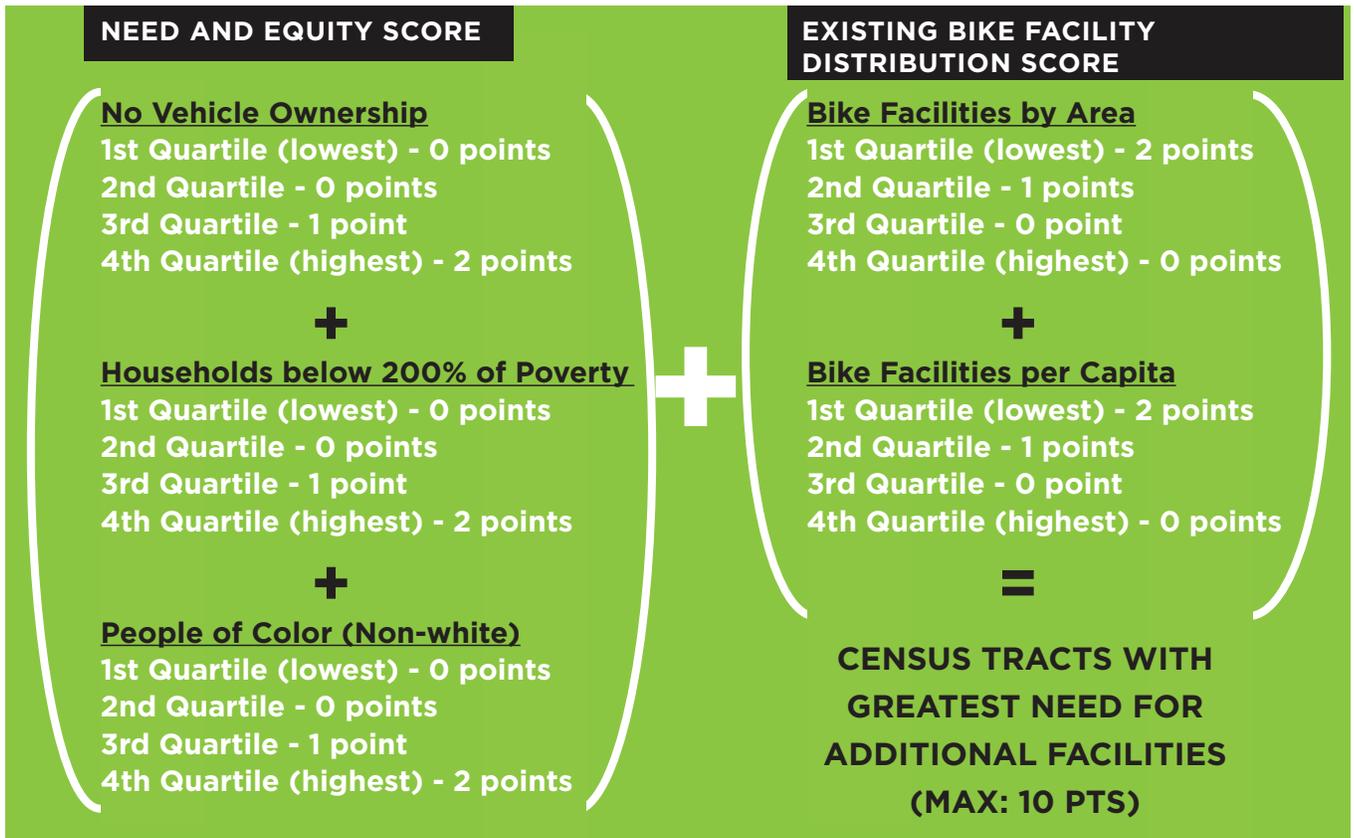


DEMOGRAPHICS/EQUITY ANALYSIS

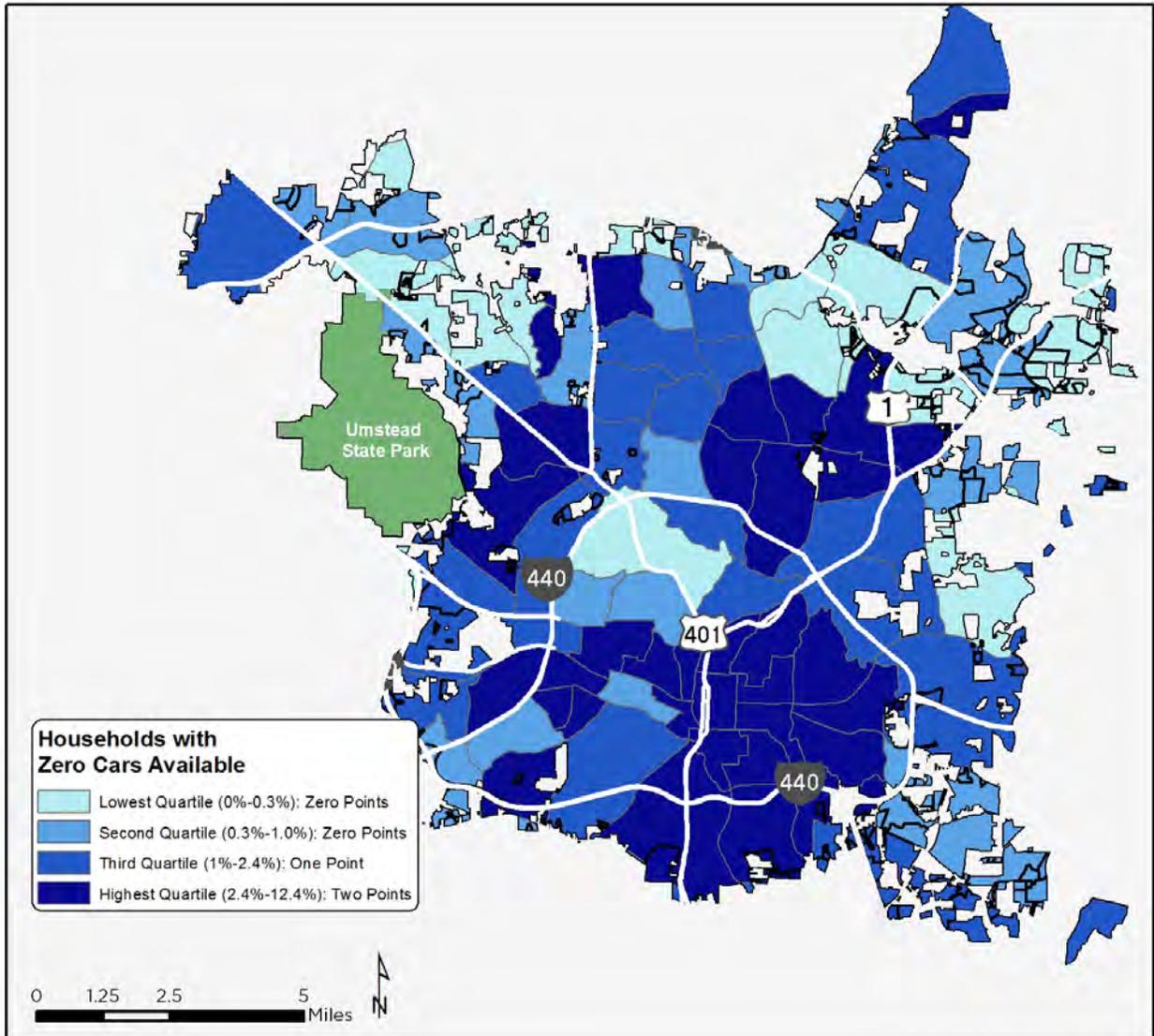
This plan includes a connected bicycle network that serves all areas of Raleigh, including areas that have a higher density of populations for whom bicycling may be a primary mode of transportation. An equity analysis examined the existing distribution of bicycle facilities compared to the distribution of these populations. For purposes of analysis, the following socioeconomic indicators define populations with a higher need, as shown on Maps 2.9-2.11:

- Percentage of households within the census tract with no automobile available for daily use
- Percentage of households below 200% of poverty level (defined by the U.S. Census Bureau)
- Percentage of population that are people of color (non-white)

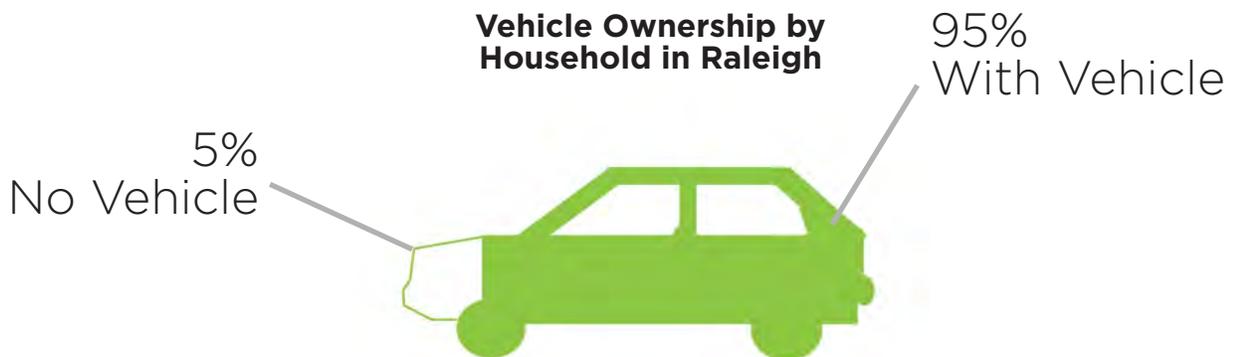
In addition, an analysis of existing, available bicycle facilities (paved shared-use paths and on-road facilities) was conducted by geography and population to identify deficiencies in supply (Maps 2.12-2.13). The results of the demographic analysis combined with the assessment of existing facilities highlight several areas of Raleigh where improvements to the bicycle system would benefit populations and areas of potential need (Map 2.14).



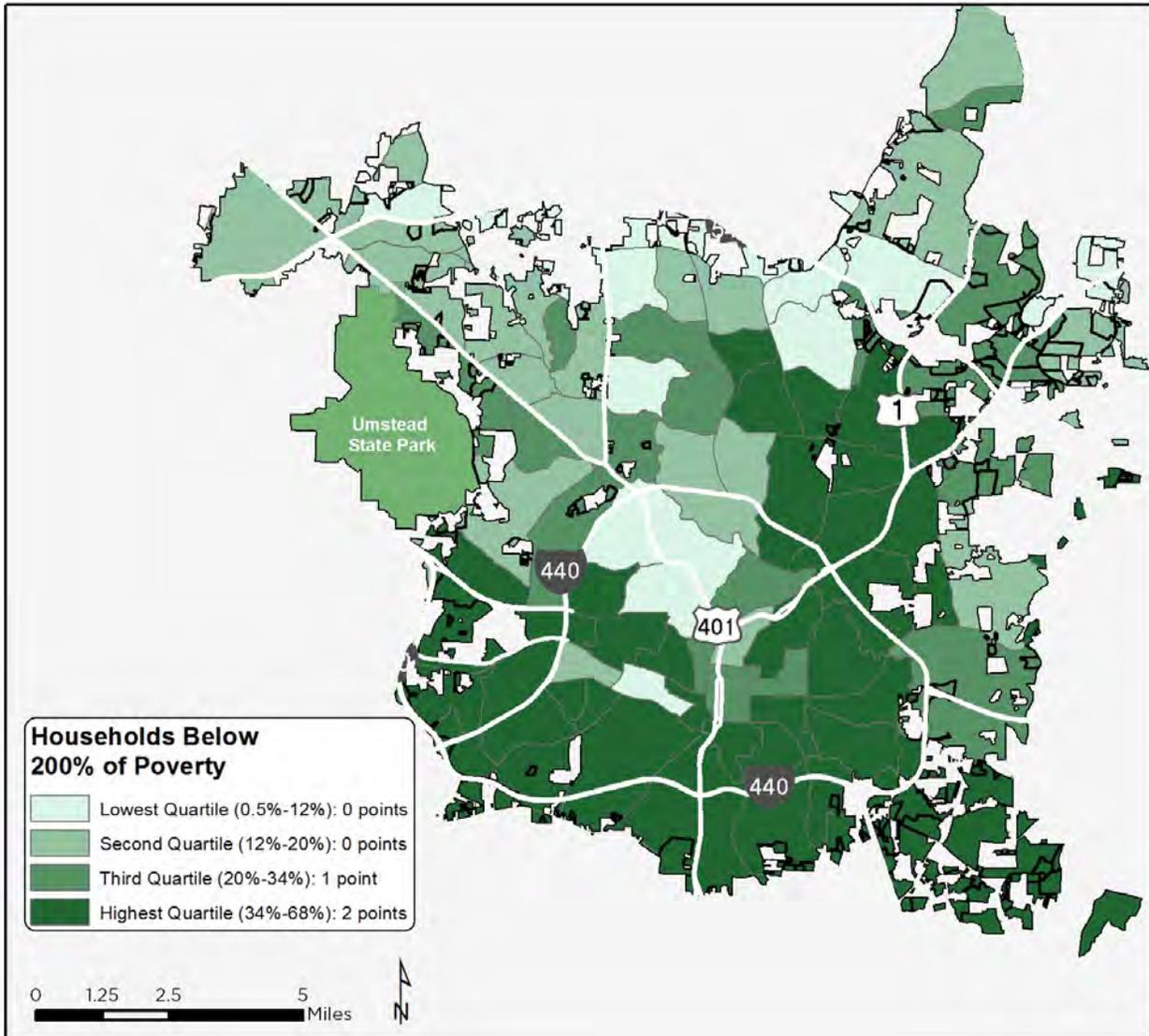
Map 2.9 Percentage of Households With No Automobile



Some portions of Raleigh, especially the eastern side of Downtown, have as high as 12% zero car ownership.

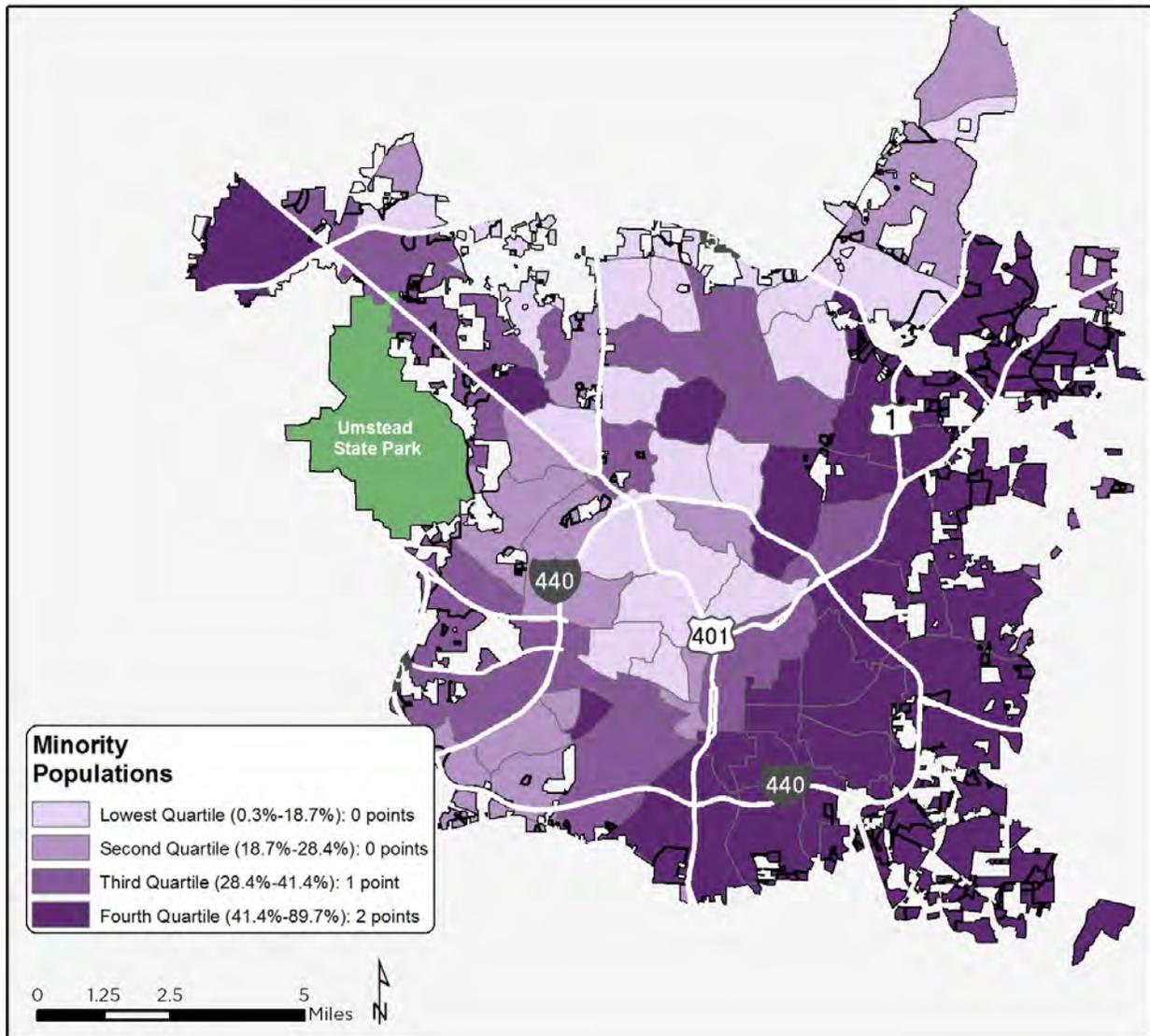


Map 2.10 Percentage of Households Below 200% of Poverty Level



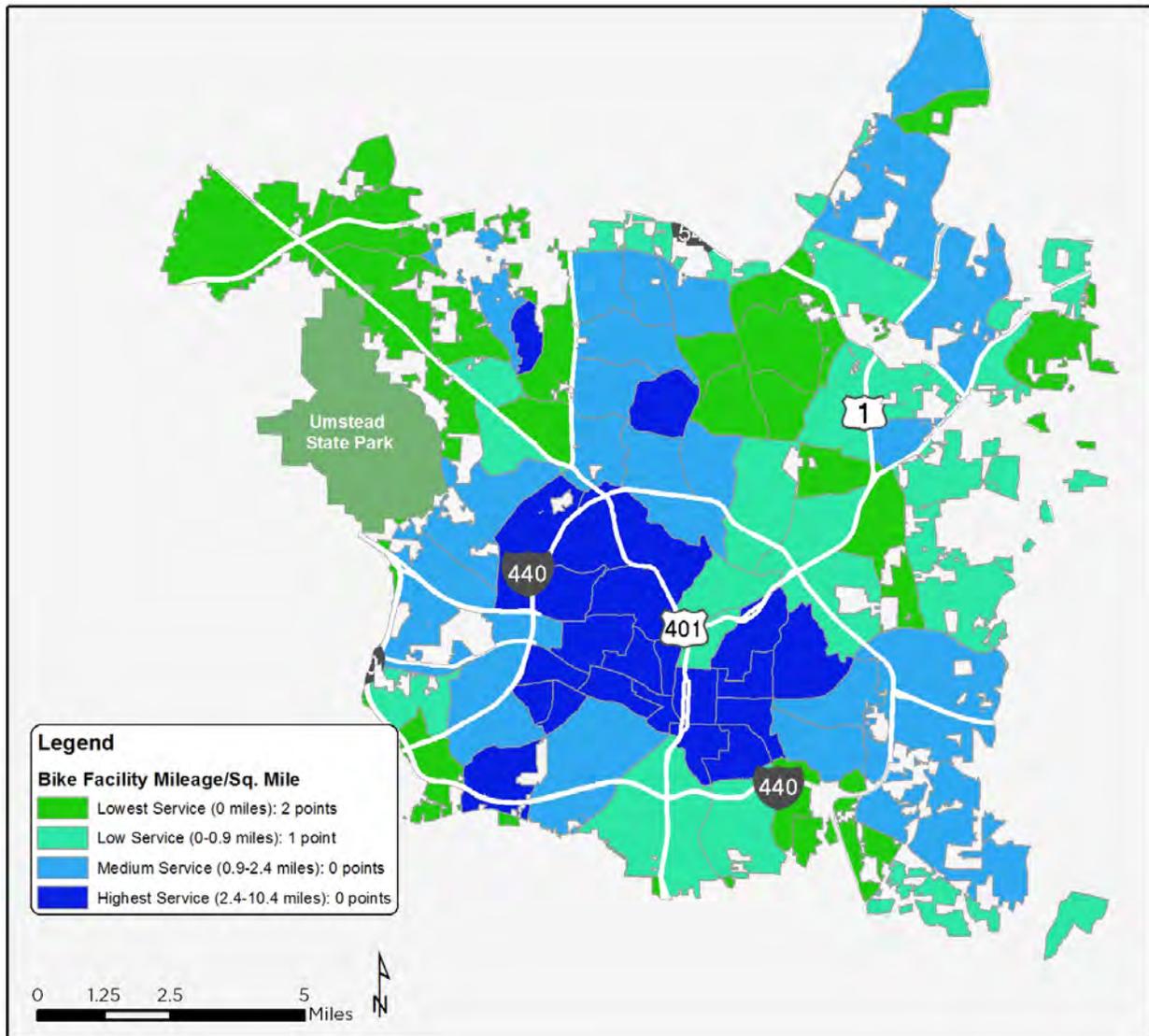
According to 2012 ACS data, 16.4% of persons in Raleigh live below the poverty level. This map covers households that are twice the level of poverty or below.

Map 2.11 Percentage of Population that are People of Color



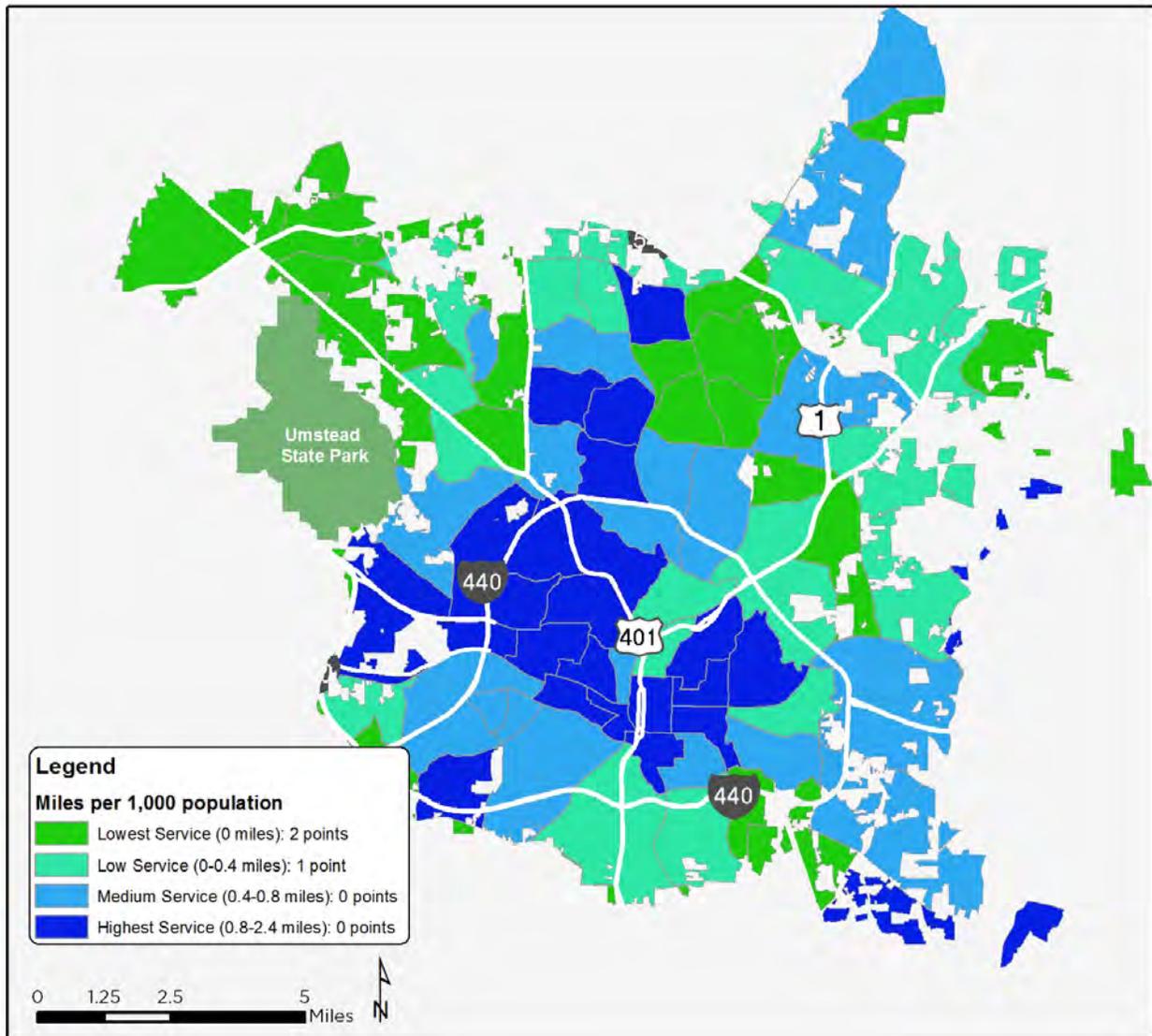
According to the 2010 US Census, 57.5% of Raleigh's population is white; 29.3% African-American; 11.4% Hispanic or Latino; 4.3% Asian; 6.2% other.

Map 2.12 Bicycle Facility Miles per Square Mile



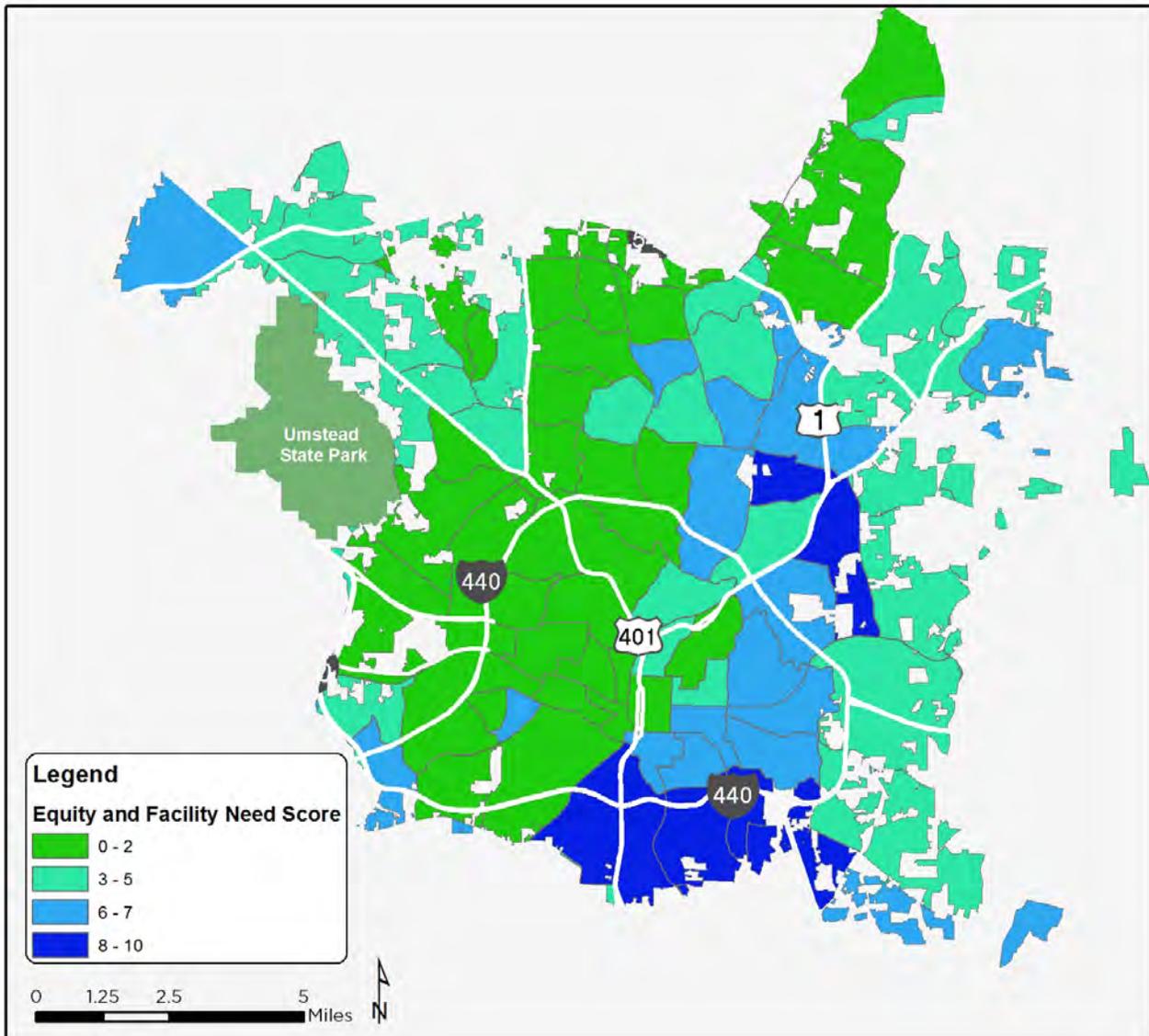
The densest areas of bicycle facilities tend to be inside the Beltline.

Map 2.13 Bicycle Facility Miles Per Capita



The highest concentrations of bicycle facilities by population are within the Beltline with some additional areas mostly north of the Beltline.

Map 2.14 Equity and Bicycle Service



Darker colors indicate concentration of areas where equity and need should be addressed. These areas primarily fall on a north-south axis on the eastern side of Downtown Raleigh. The highest scores are along and south of the Beltline. This scoring was used as a criteria in the prioritization ranking of bike network projects.



Public input was received at Chavis Park on July 13, 2015.

COMMUNITY-IDENTIFIED NEEDS

The public outreach process included five major components:

- Informal Steering Committee Meetings
- Public Events/Open Houses
- Project Website
- Interactive Online Map (part of project website)
- Cityzen Comment Form (online and hard copy)

The major themes and community priorities identified through these outreach processes are reflected in this section. For more detailed results of each forum, see Appendix B.

GENERAL THEMES

While the project team received a broad range of comments and suggestions, clear themes emerged related to the overarching vision for a more bicycle-friendly Raleigh and the key opportunities and constraints relevant to achieving that vision. The comments from citizens and stakeholders are organized into general categories below:

General Bicyclist Needs and Comments

- Stakeholders and citizens want safer places to bike for the “Interested but Concerned” crowd (more greenways, cycle tracks, and buffered bike lanes). Sharrows are not enough for these cyclist to consider riding in-street.
- Better connectivity is needed so that people can bike from home to work, the store, school, or a greenway.
- Bicyclist and trail user education and etiquette should be improved.
- There are large gaps in the bicycle network in E/NE Raleigh and outside the Beltline.
- Greenways are the best place to bicycle in Raleigh.

Barriers and Constraints

- Major barriers include I-440, I-540, US 70, and S. Saunders Street.
- Cars often park in bicycle lanes.
- Bicycle lanes need to be swept and cleaned more frequently.
- Vehicular traffic and behavior is a challenge to bicycling.
- Greenway operating hours should be extended for bicycle commuters.



The Steering Committee met five times and guided the planning process.

Key Destinations and Target Areas

- The bicycle network should connect with transit and employment centers.
- Connect Cary with Raleigh via Hillsborough Street.
- Connect NC State with areas south of I-40.
- Connect to the greenway system.
- Connect downtown to Northeast Raleigh.

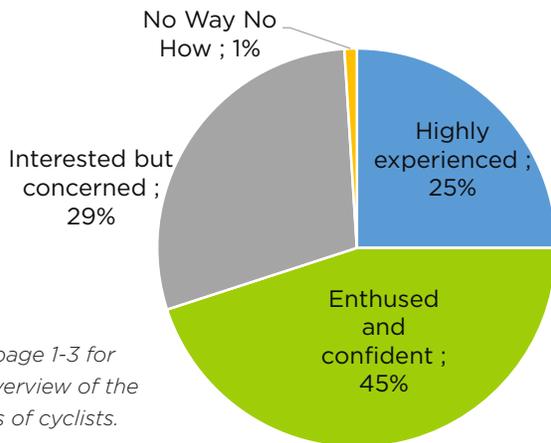
Partners and Implementation

- The business community should be engaged and involved.
- There is a need to continue expanding programs to encourage more bicycling.
- The focus should be on the highest quality projects that will encourage more ridership.

CITYZEN COMMENT FORM TRENDS

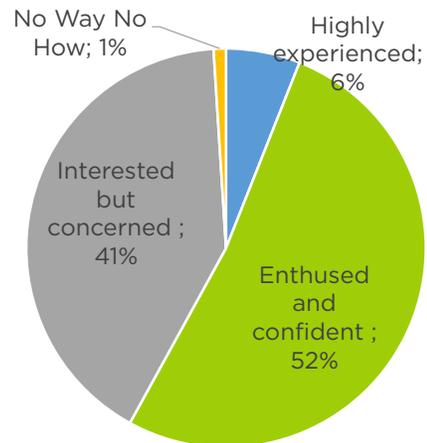
CityZen is a polling platform that the City of Raleigh has utilized to collect, understand, and leverage their online audience data. Combining the Cityzen online comment tool with hardcopy copy comment forms allowed an opportunity to identify the type of bicyclists participating. Despite a higher number of experienced cyclists participating, their desire is still to plan for the less-experienced bicyclists in the future.

What type of bicyclist are you?

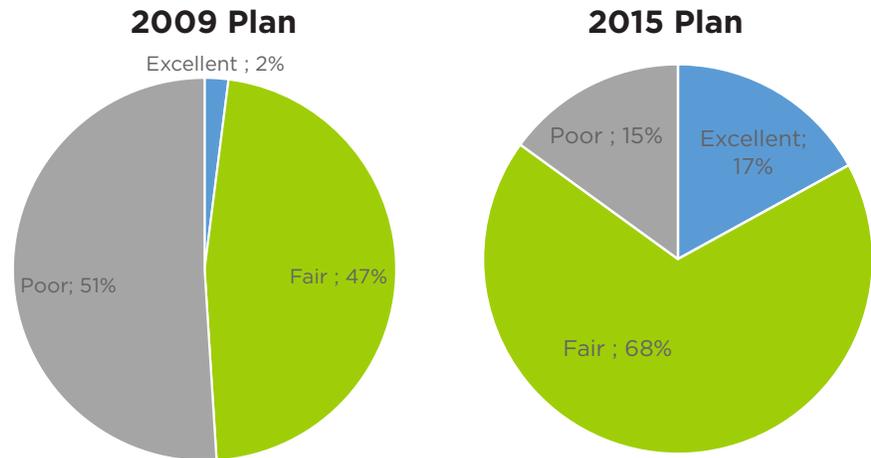


See page 1-3 for an overview of the types of cyclists.

What type of bicyclist should the City be planning for?



In the 2009 Plan and 2015 Plan Update, the same question was asked (**How do you rate bicycling conditions?**). It's clear that people believe conditions have improved; although there is still work to do.



In the 2009 Bicycle Plan, the lack of bicycle facilities was the #1 factor discouraging bicycling with the #2 factor being traffic. When asked again in 2015, those were reversed, but still the top two factors.

What are the factors that most discourage bicycling in Raleigh?

- #1 - Vehicle traffic (58% of respondents)
- #2 - Lack of bicycle facilities (45% of respondents)
- #3 - Lack of information about where bicycle facilities are located (21% of respondents)

When asked about the **most important roadways to improve**, the majority of respondents chose major arterials that connect large reaches of the City.

ROADWAYS NEEDING IMPROVEMENT

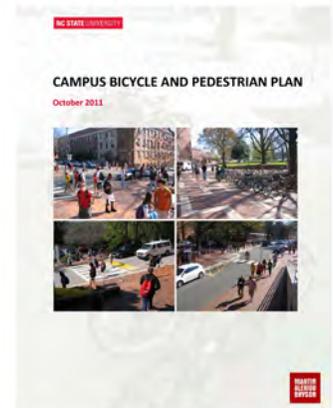
- #1 (tie) - Hillsborough Street
- #1 (tie) - Glenwood Street
- #3 - Capital Boulevard
- #4 (tie) - Peace Street
- #4 (tie) - Wade Avenue
- #4 (tie) - Six Forks Road
- #4 (tie) - Peace Street
- #8 Atlantic Avenue

REVIEW OF EXISTING PLANS

The BikeRaleigh plan update is built on a foundation of previous bicycle planning efforts, summarized below and in the table on page 2-26. This plan aims to enhance the details and intent of past city plans. The following plans reviewed early in the planning process influenced recommendations developed in subsequent chapters:

NCSU CAMPUS BICYCLE & PEDESTRIAN MASTER PLAN

In 2011, NC State University developed a Campus Bicycle and Pedestrian Plan to make the campus more bikeable and walkable through a variety of facility improvement and program development recommendations. The Plan is a master plan of improvements to meet the long term transportation needs of NC State. But it is also focused on implementation, with specific projects that have been detailed and prioritized. The Campus Bicycle and Pedestrian Plan recommendations will provide key insight as the Raleigh bike network continues to develop and expand around NC State, a main bicycle destination.



RALEIGH BIKE SHARE FEASIBILITY STUDY & IMPLEMENTATION PLAN

In 2014, the City of Raleigh conducted a feasibility study and implementation plan for a bike share program because of the growing bicycle culture and the commitment to becoming a bicycle friendly community. A bike share system represents a unique opportunity for the City to increase the use of bicycles for relatively short-range travel, reduce the negative impacts of single occupancy vehicles and encourage a shift to other modes of transportation.



Through a comprehensive analysis of population and employment trends; evaluation of existing plans and regulations; review of existing conditions; and a comprehensive stakeholder and public engagement process, the implementation of a bike share program has been found to be feasible for the City of Raleigh.

In 2016, the city began the implementation of phase one of a bike share system, including approximately 300 bicycles at 30 stations, predominately serving downtown Raleigh, East Raleigh, and NCSU. The proposed bike share service area plays a role in the prioritization recommendations presented in Chapter 4.

CITY OF RALEIGH CAPITAL AREA GREENWAY PLANNING & DESIGN GUIDE



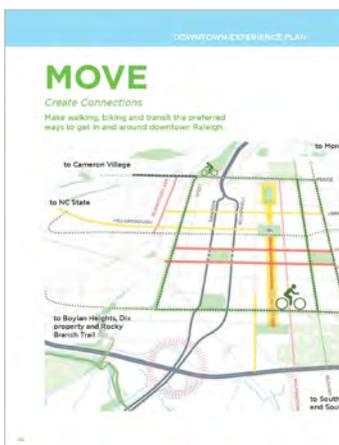
Adopted in 2015, the City of Raleigh Capital Area Greenway (CAG) Planning and Design Guide intends to assist the City of Raleigh in the planning, design, and engineering of greenway trail facilities. This document will serve as a guide to help city staff and consultants select appropriate facilities or treatments given the project context of existing and proposed greenway trails. The Guide supplements the City of Raleigh Parks, Recreation and Cultural Resources System Plan and is intended to be used simultaneously when planning and designing greenways and greenway trails in the CAG System.

A greenway classification system defines existing and proposed trails as Cross City Greenway Trails, Greenway Collector Trails, Neighborhood Greenway Trails, and Greenway Connectors. Amenities, such as trail width, lighting, and wayfinding, most appropriate for each trail classification are identified. This classification system will play a key role in the development of the on-road bicycle network recommendations.

DOWNTOWN PLAN: THE NEXT 10 YEARS

Adopted in 2015, the Downtown Plan, serves as a ten year plan for future downtown evolution. The priorities for the Downtown Plan are achievable action items that will continue the transformation of Raleigh's city center. The vision statement for the plan is founded on four key themes: *Breathe, Move, Stay, and Link*. The Move: Create Connections theme states: "Make walking, biking, and transit the preferred ways to get in and around downtown Raleigh."

To do this, the plan outlines goals and action steps for each vision theme. The following goal and action steps from the Move theme directly relate to cycling:



The Downtown Plan aims to "Make walking, biking, and transit the preferred ways to get in and around downtown Raleigh."

- MG2: Provide on-and-off street bicycle facilities and infrastructure that link all the districts to each other and to the major cycling routes into and out of downtown.
- MA-10: Implement pedestrian and bicycle improvements along Person, Blount, and Peace Streets to connect downtown to planned greenway connectors along Pigeon House Branch and Capital Boulevard.
- MA-11: Prioritize West Street as a north-south greenway connector that will connect to greenways north and south of downtown.
- MA-12: Study creating a cycle track along West Street north-south from future park-to-park.

BIKERALEIGH PLAN | UPDATE

- MA-13: Increase bike lanes throughout downtown, notably along Wilmington and Salisbury Streets.
- MA-14: Implement a Bike Share program in downtown.
- MA-15: Reimagine the Capital City Trail into a multi-cultural historic bike trail circumnavigating the downtown.
- MA-16: Install additional bike corrals in downtown as demand for bike parking grows.
- MA-17: Implement specific design and graphic standards to identify and distinguish the Art to Heart Trail.
- MA-18: Fund the implementation of the South Park Heritage Trail re-development strategies and connect the walking route portion of the trail to other planned trails, including the proposed Blount/Person Streets Heritage Walk, creating multiple loop options.

OTHER PREVIOUS PLANNING EFFORTS

Title	Year	Bicycle Recommendation
CORRIDOR STUDIES		
Blue Ridge Road District Corridor Study	2012	Bike Lanes from Western Boulevard to Blue Ridge Road/Duraleigh Road
Blount Street/Person Street Corridor Study	2013	One-way Road Diet: Bike Lanes Two-Way Restoration: Bike Lanes and Sharrows
New Bern Avenue Corridor Study	2012	Bike Lanes from Swain Street to Raleigh Boulevard; Wide outside lanes and sidepath recommendation from Raleigh Boulevard to Crabtree Creek
Capital Boulevard Corridor Study	2012	Greenway connection along the west side of Capital Blvd from Peace Street to Atlantic and then switching to the east side of Capital from Atlantic to Crabtree Blvd.
Lake Wheeler Road Corridor Study	2014	Bike Lanes from I-40 to Tryon Road
Western Boulevard Corridor Study	2014	Bike Lanes on Avent Ferry Road from Centennial Blvd to Western Blvd; Bike/ped tunnel underneath Western Blvd at Avent Ferry;

Title	Year	Bicycle Recommendation
Jones Franklin Area Study	2011	Continue multi-use path along Western Boulevard to the Jones Franklin Road intersection and farther south if feasible.
West Morgan Area Study	2011	Greenway connection along the Ash Avenue connector; Bike lanes on West Morgan Street from Hillsborough Street to study limits; Bike lanes on Hillsborough Street from Ashe Ave to study limits
SMALL AREA PLANS/STUDIES		
Crabtree Valley Transportation Area Study	2011	Add bike lanes to Park Lake Avenue; Connect Bicycle/Pedestrian overpass of Glenwood Avenue from Marriott Drive to Crabtree Valley Mall; Improve the intersection of Home-wood Banks and Blue Ridge Road with bike lanes.
Buffalo - New Hope Area Plan	2015	Evaluate Buffalo Road as a high priority route during BikeRaleigh plan update;

The City has a number of active studies and plans that, once adopted, will have specific bicycle recommendations:

- Southern Gateway Corridor Study (South Saunders Street and South Wilmington Street)
- Six Forks Road Corridor Study (I-440 to Spring Forest Road)
- Cameron Village and Hillsborough Street Small Area Plans
- Northwest Raleigh Bicycle Corridors Study

ASSORTMENT OF EXISTING FACILITIES IN RALEIGH



*Bicycle lane on
Avent Ferry Rd*



*Branded
BikeRaleigh racks*



*Sharrows on
Oakwood Ave*



*Cyclists on a Capital
Area Greenway Trail*



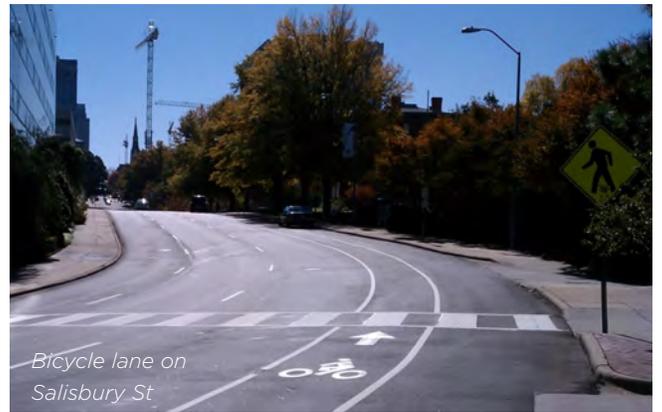
*Hargett St.
bike corral*



Bicycle lane on Hillsborough St near NCSU



*Bicycle lanes implemented through a
resurfacing and road diet.*



*Bicycle lane on
Salisbury St*



*Artistic bike rack
near the old state
capital*



*Capital Area
Greenway Trail*



*Sharrows on
West Cabarrus St*